

C. Remarks

The claims are 1-3, with claim 1 being the sole independent claim. Claim 1 has been amended to better define the present invention. Support for this amendment may be found, for example, in the substitute specification at page 15, lines 20-26, and page 23, lines 18-24. No new matter has been added. Reconsideration of the claims is expressly requested.

Claims 1-3 stand rejected under 35 U.S.C. § 103(a) as being allegedly obvious from U.S. Patent No. 4,825,249 (Oki) in view of U.S. Patent Nos. 3,024,209 (Ferrigno) and 3,387,071 (Cahill). The grounds of rejection are respectfully traversed.

Prior to addressing the merits of rejection, Applicants would like to briefly discuss some of the features and advantages of the presently claimed invention. That invention, in pertinent part, is related to a process for producing a cleaning blade. This process includes the steps of (1) drying a blade formed of a urethane resin so that the urethane resin has a water content of 1% by weight or less; (2) impregnating at least a contact portion of the blade with an isocyanate compound; (3) blowing warm air or hot air on the blade surface to remove the isocyanate compound remaining on the blade surface; and (4) allowing the urethane resin that forms the blade to react with the isocyanate compound with which the blade stands impregnated, to form a cured layer formed chiefly of allophanate linkages.

Importantly, in addition to the limited water content of the urethane blade, the isocyanate compound has at least two isocyanate groups in one molecule. As a result, a cured layer can be more effectively formed.

Oki is related to a method for producing a cleaning blade for an electrophotographic copying machine. Oki discloses a urethane rubber reaction in which urethane bonds are formed by the reaction of isocyanate groups and hydroxyl groups, urea bonds are formed by the reaction of isocyanate groups and amino groups, and allophanate bonds are formed by the reaction of isocyanate groups and urethane derivatives or urea derivatives. Thus, the resulting urethane rubber has many unreacted substances in unpredictable amounts. Accordingly, in Oki, these unreacted substances are allowed to react on the surface of the urethane rubber with a perfluoropolyether that has at least at one end thereof an isocyanate, hydroxyl, carboxyl, or amino group, thereby providing the urethane rubber surface with lubricity and abrasive resistance.

Oki describes the general process of forming a urethane rubber blade (a plate material before being subjected to the final treatment), which is similar to that in the present invention. The water content as recited in the present claims, however, is an issue related to the surface treatment process and not to the process of forming the blade. Oki does not refer to the water content in the surface treatment process. Hence, it does not disclose or suggest the water content recited in the present claims.

In Oki, the blade surface is coated with a perfluoropolyether, which has at least at one end thereof an isocyanate, hydroxyl, carboxyl, or amino group, to thereby provide the urethane rubber surface with lubricity and abrasive resistance. In Example 4 of Oki, a mixed system with an isocyanate compound is evaluated, but it is not at all clear how much effect is exerted only by the isocyanate compound.

Thus, Applicants respectfully submit that in addition to not disclosing or suggesting the drying step as presently claimed, Oki also fails to disclose or suggest an isocyanate compound with at least two isocyanate groups. At most, Oki discloses a surface treatment with a perfluoropolyether in which an isocyanate group acts only at one end. In the present invention, the isocyanate compound having at least two isocyanate groups in one molecule is used. That is, the isocyanate compound used in the present invention is considerably different in structure from the isocyanate compound used in Oki.

In the present invention, since the isocyanate compound has at least two isocyanate groups in one molecule, additional water content may cause a problem of a competitive reaction of the isocyanate with water in lieu of the urethane. However, since Oki teaches coating the blade surface with a perfluoropolyether in which an isocyanate group is only at its end, neither the competitive reaction problem nor a solution thereto are recognized. Specifically, in Oki, since terminal groups are reacted, the necessary reaction is completed before water can influence the formation of a desired surface layer. If two or more isocyanate groups are present, the reaction proceeds three-dimensionally and water affects this reaction. Thus, Applicants submit that one skilled in the art would not deem the water content in the urethane blade to be important in the context of the disclosure in Oki.

Ferrigno cannot provide the teachings missing in Oki. Ferrigno is directed to polyurethane foam containing organic pigment. Ferrigno discloses that the “pigments should be substantially dry (contain less than about 1 percent of free moisture) when added

to a polyurethane prepolymer inasmuch as water carried by the pigment will react with free isocyanate groups in the system” (col. 5, lines 50-54).

Ferrigno, like Oki, does not disclose or suggest or suggest an isocyanate compound with at least two isocyanate groups. At most, as noted in the above excerpt, it refers to free isocyanate groups in the pigment making context. This context is considerably different from both Oki and the presently claimed invention. In fact, the moisture content mentioned by Ferrigno is not with respect to urethane, but with respect to the pigment, which is added to a polyurethane prepolymer.

The following table provides a comparison of the process the steps in the present invention and in both Oki and Ferrigno.

Steps	Present invention	Oki	Ferrigno
Urethane rubber formation	Reaction of isocyanate and polyol; blade material (pretreatment)	Reaction of isocyanate and polyol; urethane bonds, urea bonds, and allophanate bonds; presence of residue remaining after reaction (pretreatment)	Reaction of isocyanate and polyol; main material for foaming; filler plays an important role in foaming, so water content therein is controlled.
Foaming	No foaming.	No foaming.	Addition of water at the time of foaming is important.
Surface treatment	Reaction of isocyanate compound having two or more isocyanate groups in one molecule.	Reaction of isocyanate groups is involved, but the main subject relates to coating the urethane rubber surface with perfluoropolyether	Not applicable
Types	Two or more isocyanate	A hydroxyl, carboxyl, or	Not applicable

and positions of functional groups	groups per molecule present in the isocyanate compound.	amino group (terminal group) in perfluoropolyether at its end	
Function of functional group	Due to two or more isocyanate groups, a cured layer can be more effectively formed	Perfluoropolyether functionality and its terminal groups are used for a reaction with urethane as a base	Not applicable
Relation with water	In the formation of a cured layer, isocyanate groups and water (-OH) are in a competitive reaction relationship; the blade material contains 1% or less water/no water	Not applicable	Filler (core material for foaming) is subjected to drying treatment for reducing free moisture content to 1% or less. A certain amount of water is added at the time of foaming urethane, where the amount of water to be added is much greater than 1%.

Applicants respectfully submit that, at most, Ferrigno hints at a reaction of water with free isocyanate groups in the pigment making context. There is no disclosure in either Oki or Ferrigno that water can be detrimental in the blade making process.

Furthermore, due to the use of perfluoropolyether, in which an isocyanate group is only at its end, the effect water can have when an isocyanate compound as in the present invention is used is not recognized.

Thus, Applicants respectfully submit that in addition to failing to disclose the claimed isocyanate compound, neither reference discloses the criticality of the claimed water content. Even in the context of the pigment in Ferrigno, the amount of free moisture in a pigment does not correlate to the water content of a urethane blade. As mentioned previously by Applicants, the criticality of this water content is demonstrated by the data presented in the subject application in Example 1 and Comparative Example 1. This data clearly rebuts any presumption that it would have been obvious to carry out the drying step in Oki to limit the moisture content as claimed.

In conclusion, Applicants respectfully submit that whether considered separately or in any combination, the documents of record fail to disclose or suggest the presently claimed elements. Wherefore, withdrawal of the outstanding rejections and passage of the application to issue are respectfully requested.

Applicants' undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our below listed address.

Respectfully submitted,

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